

Remarks

Claims 1 and 3-13 are pending. By this Amendment, claims 1 and 8 have been amended and claim 2 has been cancelled. No new matter is believed added. Reconsideration and allowance are respectfully requested in view of the following remarks.

Claims 1-13 are rejected under 35 U.S.C. §103(a) over Simpson et al. (US 6,232,636), hereafter "Simpson."

This rejection is defective because Simpson fails to teach or suggest each and every feature of the present invention as required by 35 U.S.C. §103. Further, the Examiner has failed to establish a *prima facie* case of obviousness in support of the rejection under 35 U.S.C. §103(a).

Claim 1 sets forth, *inter alia*, "a silicon layer formed over the buried oxide layer, wherein the silicon layer comprises a body region, a source region formed on the body region, a drain region, and a drift region extending between the body region and the drain region, wherein an origin of a doping profile of the silicon layer is within the body region of the device and has a dopant level of approximately zero."

In the Final Office Action, the Examiner alleges that "Simpson discloses in figures 1 and 2 a high frequency semiconductor device having a doping profile comprising a buried oxide (38A) and a silicon layer (32) in which an origin of a doping profile of the silicon is within a body region of the device." Applicants respectfully disagree with the Examiner's conclusion.

Simpson, as shown in FIGS. 1 and 2, discloses a doping profile having an origin (i.e., X0) that is clearly located within the lateral drift region 32, **not within the body region 30**. It is the

purpose of Simpson to provide multiple linear charge slope regions M1, M2, **within a lateral drift region 32** of SOI MOS transistor 20 (see, e.g., col. 3, lines 45-64). Simpson does not teach or suggest that the origin XO of the multiple linear charge slope regions M1, M2 (FIG. 2) can or should be located within the body region 30. On the contrary, Simpson discloses that the origin XO is located within the lateral drift region 32 “about 2-4 microns from the edge 30A of the body region 30” (col. 4, lines 37-38). The Examiner also alleges that any “region in a semiconductor layer can be defined as body region” (Final Office Action, page 3, lines 3-4). Although Applicants disagree with the Examiner’s position regarding the claimed “body region,” Applicants have amended claim 1 to clarify the relative locations of the body region, source region, drain region, and drift region in the silicon layer.

The Examiner further asserts that “Simpson discloses on line 32 of column 4 that ‘the minimum charge doping  $Q_{min}$  ranging from zero to a relative low value’.” Again, Applicants respectfully disagree with the Examiner’s conclusion, and submit that although the minimum charge doping  $Q_{min}$  may have a relative low value at XO, there is absolutely no suggestion in Simpson that the origin of this doping extends into the body region 30. As such, there is no support in Simpson for the Examiner’s statement that it “would have been obvious that the doping profile is shifted to the left side of the oxide layer (38A).”

Claims 3-7 depend from independent claim 1 and are, therefore, patentable for at least the reasons set forth above.

Claim 8 sets forth a semiconductor device having a “silicon layer formed over the buried oxide layer, wherein the silicon layer comprises a body region, a source region formed on the

body region, a drain region, and a drift region extending between the body region and the drain region,” and “a top oxide layer formed over the silicon layer, wherein a doping profile of the silicon layer has an origin that has a dopant level of approximately zero, and wherein **the origin is within the body region, approximately 2 to 4 $\mu$ m from an edge of the top oxide layer.**” As discussed above, Simpson discloses a doping profile having an origin (i.e., X0) that is located within the lateral drift region 32 of SOI MOS transistor 20, not within the body region 30 as claimed. Further, Simpson discloses that the origin X0 is located within the lateral drift region 32 “about 2-4 microns from the edge 30A of the body region 30” (i.e., outside of the body region 30). Thus, not only does Simpson fail to disclose a doping profile having an origin located within a body region, but also a doping profile having an origin located within a body region, wherein the origin is located “approximately 2 to 4 $\mu$ m from an edge of the top oxide layer.” Accordingly, Applicants submit that claim 8 is allowable.

Claims 9-13 depend from independent claim 8 and are, therefore, patentable for at least the reasons set forth above.

Claims 1-13 are rejected under 35 U.S.C. §103(a) over Merchant et al. (US 5,300,448), hereafter “Merchant.”

This rejection is defective because Merchant fails to teach or suggest each and every feature of the present invention as required by 35 U.S.C. §103. Further, the Examiner has failed to establish a *prima facie* case of obviousness in support of the rejection under 35 U.S.C. §103(a).

As detailed above, claim 1 sets forth “a silicon layer formed over the buried oxide layer,

wherein the silicon layer comprises a body region, a source region formed on the body region, a drain region, and a drift region extending between the body region and the drain region, wherein an origin of a doping profile of the silicon layer is within the body region of the device and has a dopant level of approximately zero.” Similarly, claim 8 sets forth a semiconductor device having a “silicon layer formed over the buried oxide layer, wherein the silicon layer comprises a body region, a source region formed on the body region, a drain region, and a drift region extending between the body region and the drain region,” and “a top oxide layer formed over the silicon layer, wherein a doping profile of the silicon layer has an origin that has a dopant level of approximately zero, and wherein the origin is within the body region, approximately 2 to 4 $\mu$ m from an edge of the top oxide layer.” Merchant fails to teach or suggest a doping profile, having an origin with a dopant level of approximately zero, that is within a body region as claimed.

In the Office Action, the Examiner alleges that “Merchant et al also discloses a ‘shifted doping profile’ in the silicon layer in which the dopant level is approximately zero. Note figures 3-4E of Merchant et al.” Contrary to claims 1 and 8, however, the origin of the doping profile of Merchant is located within a linear doping region 5, not within the body 9.

Merchant discloses a linear doping region 5 formed within a thin layer of silicon 1 that extends “between the polysilicon gate 7 and its underlying gate oxide 8 to the drain region 12 and aluminum drain contact 16” (col. 4, lines 4-7). The linear doping region 5 has a linear doping profile as depicted in FIG. 4E. The linear doping profile of 4E is obtained using the mask 4 shown in FIG. 2B. In particular, it can be seen by comparing FIGS. 2B and 2F that the

smallest opening in the mask 4 is located a distance (e.g.,  $10\mu\text{m}$  as shown in FIGS. 4A-4E) to the right of the location where the body 9 contacts the linear doping region 5. Clearly, therefore, the origin of the doping profile is not within the body 9 as claimed in claims 1 and 8 of the present invention. Rather, the origin of the doping profile is located within the linear doping region 5.

Claims 3-7 and 9-13 depend from independent claims 1 and 8, respectfully, and are, therefore, patentable for at least the reasons set forth above.

Accordingly, Applicants respectfully submit that claims 1 and 3 -13 are in condition for allowance.

If the Examiner believes that anything further is necessary to place the application in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney at the telephone number listed below.

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Respectfully submitted,



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